WHAT IS CLAIMED IS:

1. A method of determining scalefactors used to encode a signal, comprising the steps of:

associating a plurality of distortion thresholds, respectively, with a plurality of frequency scalefactor bands of the signal;

transforming the signal to yield a plurality of sets of transform coefficients, one set for each of the frequency scalefactor bands; and

calculating a plurality of total scaling values, one for each of the frequency scalefactor bands, such that an anticipated distortion based on the product of a transform coefficient for a given scalefactor band with its respective total scaling value is less than a corresponding one of the distortion thresholds.

2. The method of Claim 1 wherein the signal is a digital signal, and further comprising the step of converting an analog signal to the digital signal.

3. The method of Claim 1 wherein said associating step uses distortion thresholds which are based on psychoacoustic masking.

4. The method of Claim 1 wherein said calculating step includes the steps of:

for a given frequency scalefactor band, obtaining a first term based on a corresponding distortion threshold; and

obtaining a second term based on a sum of the transform coefficients

5. The method of Claim 4 wherein:

the first term is obtained from a first lookup table; and

the second term is obtained from a second lookup table.

6. The method of Claim 1 wherein a given total scaling value A_{sfb} for a particular frequency scalefactor band is calculated according to the equation:

$$A_{sfb} = 2[4/(9BW_{sfb})]^{2/3} * (1/M_{sfb})^{2/3} * (\Sigma x_i)^{1/3},$$

where BW_{sfb} is the bandwidth of the particular frequency scalefactor band, M_{sfb} is the corresponding distortion threshold, and Σx_i is the sum of all of the transform coefficients for the particular scalefactor band.

7. The method of Claim 1, further comprising the steps of:
identifying one of the total scaling values as a minimum nonzero value; and
normalizing at least one of the total scaling values using the minimum nonzero value, to yield a respective plurality of scalefactors, one for each scalefactor band.

8. The method of Claim 7, further comprising the steps of:
setting a global gain factor to the minimum nonzero value; and
re-quantizing the transform coefficients using the global gain factor and the scalefactors.

9. The method of Claim 8, further comprising the steps of:
computing a number of bits required for said quantizing step; and
comparing the number of required bits to a predetermined number of available bits.

10. The method of Claim 9 wherein said comparing step establishes that the number of required bits is greater than the predetermined number of available bits, and further comprising the steps of:
reducing the global gain factor; and
quantizing the transform coefficients using the reduced global gain factor and the scalefactors.

11. A method of encoding an audio signal, comprising the steps of:
identifying a plurality of frequency scalefactor bands of the audio signal;
associating a plurality of distortion thresholds, respectively, with the plurality of frequency scalefactor bands of the audio signal, the distortion levels being based on a psychoacoustic mask;
transforming the audio signal to yield a plurality of transform coefficients, one for each of the frequency scalefactor bands;

calculating a plurality of total scaling values, one for each of the frequency scalefactor bands, based on the distortion thresholds and the transform coefficients;

normalizing at least one of the total scaling values using a minimum nonzero one of the total scaling values, to yield a respective plurality of scalefactors, one for each scalefactor band;

setting a global gain factor to the minimum nonzero total scaling value;

quantizing the transform coefficients using the global gain factor and the scalefactors, to yield an output bit stream;

computing a number of bits required from said quantizing step;

comparing the number of required bits to a predetermined number of available bits; and

packing the output bit stream into a frame.

12. The method of Claim 11 wherein said calculating step includes the step of obtaining a term from a lookup table based on a corresponding distortion threshold.

13. The method of Claim 11 wherein said calculating step includes the step of obtaining a term from a lookup table based on a sum of the transform coefficients.

14. The method of Claim 11 wherein a given total scaling value A_{sfb} for a particular frequency scalefactor band is calculated according to the equation:

$$A_{sfb} = 2[4/(9BW_{sfb})]^{2/3} * (1/M_{sfb})^{2/3} * (\Sigma x_i)^{1/3},$$

where BW_{sfb} is the bandwidth of the particular frequency scalefactor band, M_{sfb} is the corresponding distortion threshold, and Σx_i is the sum of all of the transform coefficients for the particular scalefactor band.

15. A device for encoding a signal, comprising:

means for associating a plurality of distortion thresholds, respectively, with a plurality of frequency scalefactor bands of the signal;

means for transforming the signal to yield a plurality of transform coefficients, one for each of the frequency scalefactor bands; and

means for calculating a plurality of total scaling values, one for each of the frequency scalefactor bands, such that an anticipated distortion based on the product of a transform coefficient for a given scalefactor band with its respective total scaling value is less than a corresponding one of the distortion thresholds.

16. The device of Claim 15 wherein a given total scaling value A_{sfb} for a particular frequency scalefactor band is calculated according to the equation:

$$A_{sfb} = 2[4/(9BW_{sfb})]^{2/3} * (1/M_{sfb})^{2/3} * (\Sigma x_i)^{1/3},$$

where BW_{sfb} is the bandwidth of the particular frequency scalefactor band, M_{sfb} is the corresponding distortion threshold, and Σx_i is the sum of all of the transform coefficients for the particular scalefactor band.

17. The device of Claim 15, further comprising means for normalizing at least one of the total scaling values using a minimum nonzero one of the total scaling values, to yield a respective plurality of scalefactors, one for each scalefactor band.

18. An audio encoder comprising:

an input for receiving an audio signal;

a psychoacoustic mask providing a plurality of distortion thresholds, respectively, for a plurality of frequency scalefactor bands of the audio signal;

a frequency transform which operates on the audio signal to yield a plurality of transform coefficients, one for each of the frequency scalefactor bands; and

a quantizer which calculates a plurality of total scaling values, one for each of the frequency scalefactor bands, such that an anticipated distortion based on the product of a transform coefficient for a given scalefactor band with its respective total scaling value is less than a corresponding one of the distortion thresholds.

19. The audio encoder of Claim 18 wherein, for calculation of a total scaling value for a given frequency scalefactor band, said quantizer obtains a first term based on a corresponding distortion threshold, and obtains a second term based on a sum of the transform coefficients.

20. The audio encoder of Claim 18 wherein:
the first term is obtained from a first lookup table; and
the second term is obtained from a second lookup table.

21. The audio encoder of Claim 18 wherein a given total scaling value A_{sfb} for a particular frequency scalefactor band is calculated according to the equation:

$$A_{sfb} = 2[4/(9BW_{sfb})]^{2/3} * (1/M_{sfb})^{2/3} * (\Sigma x_i)^{1/3},$$

where BW_{sfb} is the bandwidth of the particular frequency scalefactor band, M_{sfb} is the corresponding distortion threshold, and Σx_i is the sum of all of the transform coefficients for the particular scalefactor band.

22. The audio encoder of Claim 18 wherein said quantizer normalizes all of the total scaling values using a minimum nonzero one of the total scaling values, to yield a respective plurality of scalefactors, one for each scalefactor band.

23. The audio encoder of Claim 22 wherein said quantizer sets a global gain factor to the minimum nonzero value, and quantizes the transform coefficients using the global gain factor and the scalefactors.

24. The audio encoder of Claim 23 wherein said quantizer further compares a number of bits required for said quantizing step to a predetermined number of available bits.

25. The audio encoder of Claim 24 wherein said quantizer further reduces the global gain factor and quantizes the transform coefficients using the reduced global gain factor and the scalefactors, in response to a determination that the number of required bits is greater than the predetermined number of available bits.

26. A computer program product comprising:
a computer-readable storage medium; and
program instructions stored on said storage medium for calculating a plurality of total scaling values associated with different frequency scalefactor bands of a

signal, using transform coefficients of the signal and distortion thresholds for each frequency scalefactor band, such that the product of a transform coefficient for a given scalefactor band with its respective total scaling value is less than a corresponding one of the distortion thresholds.

27. The computer program product of Claim 26 wherein said program instructions further carry out a frequency transform of the signal to yield the transform coefficients.

28. The computer program product of Claim 26 wherein said program instructions further provide the distortion thresholds based on a psychoacoustic mask.

29. The computer program product of Claim 26 wherein said program instructions calculate a total scaling value for a given frequency scalefactor band by obtaining a first term based on a corresponding distortion threshold, and obtaining a second term based on a sum of the transform coefficients.

30. The computer program product of Claim 29 wherein said program instructions obtain the first term from a first lookup table, and obtain the second term from a second lookup table.

31. The computer program product of Claim 26 wherein said program instructions calculate a given total scaling value A_{sfb} for a particular frequency scalefactor band according to the equation:

$$A_{sfb} = 2[4/(9BW_{sfb})]^{2/3} * (1/M_{sfb})^{2/3} * (\Sigma x_i)^{1/3},$$

where BW_{sfb} is the bandwidth of the particular frequency scalefactor band, M_{sfb} is the corresponding distortion threshold, and Σx_i is the sum of all of the transform coefficients for the particular scalefactor band.

32. The computer program product of Claim 26 wherein said program instructions further identify one of the total scaling values as a minimum nonzero value, and normalize all of the total scaling values using the minimum nonzero value, to yield a respective plurality of scalefactors, one for each scalefactor band.

33. The computer program product of Claim 32 wherein said program instructions further set a global gain factor to the minimum nonzero value, and quantize the transform coefficients using the global gain factor and the scalefactors.

34. The computer program product of Claim 33 wherein said program instructions further compute a number of bits required for said quantizing, and compare the number of required bits to a predetermined number of available bits.

35. The computer program product of Claim 34 wherein said comparing establishes that the number of required bits is greater than the predetermined number of available bits, and said program instructions further reduce the global gain factor, and quantize the transform coefficients using the reduced global gain factor and the scalefactors.